

THE 4-H DAIRY CLUB

- | | |
|------------|-----------------|
| I. Calf | III. Cow |
| II. Heifer | IV. Cow Testing |

4-H Club Circular 65

COLUMBIA, MO.

JUNE, 1939



COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE AND THE UNITED
STATES DEPARTMENT OF AGRICULTURE COOPERATING

J. W. BURCH, Director, Agricultural Extension Service
Distributed in furtherance of the Acts of Congress of May 8, and June 30, 1914

CONTENTS*

	Page
Introduction	3
I. Care of the Dairy Calf Until Six Months of Age	3
Feeding	3
Raising the Dairy Calf Where Wholemilk is Sold	7
Reconstructed Skimmilk	7
Feeding a Dry Concentrate and Limited Wholemilk	9
New Jersey Dry-Feed Calf Mixture	9
The Use of Calf Meals	10
Raising the Calf on Whey	11
The Use of Nurse Cows	12
Quarters and Stanchions for Dairy Cows	13
Dehorning	14
Removing Extra Teats	16
Marking Calves for Identification	16
Free—Martins	16
The Common Ailments of Dairy Calves	17
Common Scours	17
II. Feeding and Care of the Dairy Calf from Six Months to One Year of Age	18
Alfalfa and Skimmilk	19
Water and Salt	19
Age of Breeding Heifers	20
III. Care of the Bred Heifer from One to Two Years of Age	20
Feeding	20
Breeding	20
Indigestion	21
Inflammations	21
Sore Feet, Cuts, Open Wounds, etc.	21
Nervous Heifers	22
IV. Kinds of Records to Keep; Testing Milk for Butterfat	22
Breeding and Calving Record	22
Feed and Other Cost Records	22
Milk and Butterfat Records	22
Sampling	23
Testing	23
V. Feeding Constituents for the Cow	24
The Water Supply	24
Mineral Feeds for Cows	25
Protein Feeds	26
Energy Feeds	27
Let Your Roughage be Your Guide	28
VI. Care of the Heifer at Calving Time	29
VII. Feeding the Cow Before and After Freshening	30
VIII. Judging	31
Dairy Cattle Judging Placing Card	31
Method of Judging Dairy Cattle	31
Procedure in Judging	32
Judging Young Dairy Stock	33
Judging Dairy Bulls	33
Giving Reasons	34
Giving Oral Reasons	34
Descriptive Terms Used in Referring to Dairy Cattle	35
IX. Fitting Animals for the Club Show	38
X. References	40
XI. The 4-H Dairy Club Objectives	40
XII. Record and Report Blank for 4-H Dairy Club Member	41

*The Leader's Guide on the 4-H Dairy Club is to be Used with this Circular.

The 4-H Dairy Club*

INTRODUCTION

The development of farm animals in an economical and practical way, by applying the best known principles, is the method through which dairy and livestock 4-H club work is accomplished. The most important objective in dairy 4-H club work is the development of boys and girls. Four-H club leaders throughout the state under the guidance of the Agricultural Extension Service, Missouri College of Agriculture, give valuable aid in the development of Missouri boys and girls by giving each dairy club member information which will be of greatest value in his or her development, and in addition, help and encourage the completion of a definite piece of agricultural work. The proper and practical development of the dairy calf is closely related with the proper and practical development of the boy or girl.

The economical improvement of the dairy herd is possible only where discarded cows are replaced by well grown heifers of improved breeding. Therefore, in addition to the development of the boy and girl the 4-H dairy club will aid in replacing, on Missouri dairy farms, animals of superior ability to produce milk and butterfat.

This circular takes up such problems as the care and management of the calf, heifer, and the producing cow, the keeping of records, the judging and selection of dairy animals, and the fitting and showing of dairy animals. It is intended as a guide for 4-H dairy calf club members throughout the three years of their projects.

I. CARE OF THE DAIRY CALF UNTIL SIX MONTHS OF AGE.

Feeding.—The most particular time in caring for the calf is during the first few months. If the calf is poorly cared for at this time it will be a great deal of trouble to raise and will not be a heavy producer when fresh. Proper care will pay better at this time than at any other period in the life of the animal.

It is always best to raise the calf by hand. Letting the calf run with the cow is bad for the cow and does not do the calf any good. Two pounds of corn meal is about as good as one pound of butterfat for the calf, so it is cheaper to take the calf away and feed skimmilk. Leave the calf with its mother for three or four days.

*Prepared by M. J. Regan and Warren Gifford, Extension Dairymen, in collaboration with T. T. Martin and E. T. Itchner, State Club Agents. Acknowledgment is made of material used from Mo. Exp. Sta. Bul. 377, "Raising the Dairy Calf," by H. A. Herman.

When the calf is first taken from the cow, let it go without milk for ten to twelve hours. Then it will be hungry and will learn to drink a good deal easier. Then take about three pounds of fresh warm milk, back the calf into a corner and straddle its neck. Hold the milk pail in one hand and with the other put two fingers into the calf's mouth and force its head into the pail. After repeating this two or three times the calf will learn to drink of its own accord.

The calf should be taught to drink milk slowly, and the bucket should be held up or placed on a rack about one foot from the ground while the calf is being fed. This practice will help to overcome some of the criticisms advanced against bucket feeding. The calf in nursing takes the milk slowly and mixes it with saliva. If the calf is permitted to gulp milk, or drinks rapidly, thus extending the esophagus, experiments show that some of the milk "spills" over into the first stomach or rumen rather than going into the true or fourth stomach as intended, and since the milk cannot escape, undesirable fermentations take place. The result is usually an unthrifty, "pot-bellied" calf.



Fig. 1.—Teaching the calf to drink from a bucket. Normal, thrifty calves can be raised on skimmilk as the principal feed.

The digestive system of the young calf is very delicate and the stomach is limited in capacity. Under natural conditions the newborn calf will nurse several times a day, but overfeeding is a more common cause of calf ailments than underfeeding. Regularity, cleanliness, and exactness are highly necessary in successful calf raising.

It is best to start feeding eight to nine pounds of milk a day and feed three times a day. In about two weeks this may be reduced to twice a day, giving one pound of milk for each ten pounds of live weight. Always make changes in feed as gradual as possible.

In case of strong calves, you may begin to change to skimmilk when the calf is about two weeks old by adding one pound of skimmilk and taking away one pound of whole milk each day until the calf is entirely on skimmilk. If the calf is not strong, it is best to wait a few days longer before starting the change. The skimmilk may then gradually be increased to sixteen pounds a day at three months of age. If there is plenty of skimmilk, it is well to let the calf have it until it is about six months old, taking it away gradually. *Always see that the milk is warm and sweet and fed in clean pails.*

—Use a dairy thermometer to determine the temperature of the milk fed. Milk should be between 95 and 100 degrees Fahrenheit. The finger is a poor measure to use in testing the temperature of the milk to be fed.

TABLE 1.—AVERAGE BIRTH WEIGHTS OF JERSEY, HOLSTEIN, GUERNSEY, AYRSHIRE AND BROWN SWISS CALVES.*

Breed	Birth Weight (lbs.)	
	Males	Females
Jersey.....	60	53
Holstein.....	95	90
Guernsey.....	71	65
Ayrshire.....	80	72
Brown Swiss†.....	85	80

*From Mo. Experiment Station Bulletin 336.

†Weights estimated.

All investigations and experience indicate that a calf must have chiefly milk the first few weeks of its life, as there is no acceptable substitute for wholemilk during the first two weeks after birth. Dairy-men selling fluid milk often find it difficult to raise calves economically as wholemilk is too expensive to feed after the first two or three weeks. Experiments have shown, however, that skimmilk is an excellent calf feed and may be substituted for whole milk after the third week with excellent results.

TABLE 2.—THE COMPOSITION OF WHOLEMILK, SKIMMILK, WHEY, AND COLOSTRUM.

Constituent	Percentage of Constituent in			
	Wholemilk	Skimmilk	Whey	Colostrum
Water.....	86.8	90.40	93.4	74.5
Fat.....	3.7	0.10	0.35	3.6
Protein.....	3.5	3.7	0.85	17.6
Sugar or carbohydrates.....	4.9	5.0	4.8	2.7
Ash or mineral.....	0.7	0.8	0.6	1.6

Where wholemilk is sold, dry skimmilk powder may be utilized by mixing with warm water and feeding in the usual manner. Some breeders utilize skimmilk powder as a major constituent of a dry grain mix with pleasing results in growth and a complete elimination of the feeding pails. In some cases calf meals or some of the proprietary meals may be used in conjunction with the skimmilk feeding. Calf meals, as a rule, can be satisfactorily used to replace only a part of the milk normally fed.

TABLE 3.—DAILY FEEDING SCHEDULE FOR THE SKIMMILK CALF. (Birth to 6 months of age)

Age of Calf	Whole Milk (lbs.)	Skim Milk (lbs.)	Grain (lbs.)	Legume Hay (lbs.)**	Silage (lbs.)
(Ayrshire, Guernsey and Jersey Breeds)					
Birth to 48 hours.....	with dam				
2 to 7 days.....	5 to 7				
7 to 15 days.....	6 to 8				
15 to 22 days*.....	8 to 1*	1 to 3*	1/16	1/16	
4 to 5 weeks.....	--	8 to 10	1/4	1/4	
5 to 6 weeks.....	--	9 to 11	1/3	1/3	
6 to 8 weeks.....	--	10 to 12	2/3	2/3	
8 to 12 weeks.....	--	12 to 14	1	1	
12 to 16 weeks.....	--	14 to 16	1 1/2	1 1/2	
16 to 24 weeks.....	--	16	2 1/2	2 1/2	1/2 to 2
(Holstein and Brown Swiss Breeds)					
Birth to 48 hours.....	with dam				
2 to 7 days.....	7 to 9				
7 to 15 days.....	9 to 11				
15 to 22 days*.....	10 to 1*	1 to 10	1/16	1/16	
4 to 5 weeks.....	--	10 to 12	1/4	1/4	
5 to 6 weeks.....	--	12 to 14	1/2	1/2	
6 to 8 weeks.....	--	14 to 16	3/4	3/4	
8 to 12 weeks.....	--	16 to 18	1	1	
12 to 16 weeks.....	--	18 to 20	1 1/4	1 1/4	1 to 2
16 to 24 weeks.....	--	20	2 1/4	2 1/4	2 to 3

*Transition period—skimmilk substituted for wholemilk at rate of 1 pound per day until change is complete and calf is receiving skimmilk by the time it is 3 to 4 weeks of age. Reconstructed skimmilk may be substituted for ordinary skimmilk at this point in the feeding schedule.

**Calves should have free access to plenty of good quality, leafy green hay. The approximate amount of hay consumed daily by a calf of this age is indicated.

The calf will begin to eat a little hay and grain at two or three weeks of age. A good way to start the calf eating grain is to put a handful of corn meal into its mouth a few times just after feeding the milk. Then keep a small box of grain in its stall for a few days and it will soon learn to eat. After that, feed it regularly and do not give it any more than it will clean up.

Minerals—The growing calf, particularly where skimmilk and legume hays are fed, seldom suffers from a shortage of minerals. As a precaution, equal parts of salt and steamed bone meal or equal parts of salt and finely ground limestone should be kept before the calves.

Water—Calves should have plenty of fresh, clean water after they are three weeks of age. Failure to provide water may result in less efficient growth of the calf.

Give the calf all of the fine legume hay, such as alfalfa, soybeans, or clover hay that it will clean up until it goes on pasture. If the calf has real good pasture, there is no need of any other roughage. The calf should be kept off of grass until it is five months of age but should have a lot for exercise.

Some Good Grain Rations for Young Calves.

1. By weight, 3 parts cracked corn, 3 parts ground oats, 3 parts wheat bran, 1 part of oil meal, and 1% of salt.
2. Three parts cracked corn, 1 part wheat bran, 1 part ground oats, 1 part blood meal, and 1% salt.

The grain should be increased so that the calf is eating about one pound per day by the time it is five to six weeks old. Three to five pounds per day is the maximum up to six months of age.

Raising the Dairy Calf Where Wholemilk is Sold

On farms where wholemilk is sold it is usually impractical to provide skimmilk for calf feeding purposes. Calves may be raised successfully where wholemilk is sold by the use of liquid skimmilk substitutes. It must be kept in mind that the young calf must have milk in its diet during the first few weeks of life. Ignoring this fact is usually responsible for the somewhat unthrifty, small, undernourished calves often found in wholemilk districts. The feeding of inadequate milk during the first few weeks of life, or eliminating milk before the calf is able to digest substitute feeds, are the two chief mistakes to avoid in feeding calves where wholemilk is sold.

Several methods of feeding have been found successful where liquid skimmilk is not available. Skimmilk powder, powdered buttermilk, semi-solid buttermilk and calf meals or gruels all offer possibilities. The dairyman should consider the cost and practicability of each method and use the plan best suited to his conditions.

RECONSTRUCTED SKIMMILK

As pointed out (Table 4) where powdered skimmilk is not prohibitive in price it may satisfactorily replace liquid skimmilk by adding 1 pound of skimmilk powder to 9 pounds of warm water.

The result is 10 pounds of skimmilk of usual composition and feeding value. Reconstructed skimmilk is fed exactly the same way as ordinary skimmilk. Care should be taken to see that remade skimmilk is at body temperature (95 to 100 degrees F.) when fed. Grain and roughages are fed according to suggestions given in Table 4.

Dairymen often raise the question of the economy of raising calves on skimmilk powder. Under market conditions it is often more economical to sell wholemilk and buy skimmilk powder. In other cases, particularly in the sale of surplus milk as delivered to wholemilk markets in bulk, the buying of skimmilk powder for feeding purposes may be a losing proposition. The economy of feeding skimmilk powder depends upon the comparative net returns the dairyman receives for his product, which is marketed as fluid milk, as compared with selling cream or butterfat and retaining the skimmilk on the farm for feeding purposes. Since most wholemilk is sold on the basis of a 3.5 per cent fat test, the returns for fat sold in the form of cream on a butterfat basis as compared to the price for wholemilk will show the price one can afford to pay for skimmilk powder. Cream is usually separated to contain from 30 to 40 per cent butterfat and on this basis each 100 pounds of 3.5 per cent milk yields about 85 to 90 pounds of skimmilk containing 9.5 per cent dry matter, thus supplying the equivalent of about 8.30 pounds of dried skimmilk. If liquid milk testing 3.5 per cent will bring \$1.50 per hundred pounds net, and butterfat is worth 30 cents per pound, the producer receives 45 cents for the skimmilk sold in 100 pounds of wholemilk. If skimmilk is needed for calf feeding the dairyman cannot afford to pay more than \$5.42 per hundred pounds for dried skimmilk powder. At this figure the dairyman is just breaking even financially. In many cases it would be more profitable to separate surplus milk.

Table 4 shows the maximum price the dairyman can afford to pay for one hundred pounds of dried skimmilk for calf feeding purposes at various wholemilk and corresponding butterfat prices.

TABLE 4.—A COMPARISON BETWEEN THE PRICE OF WHOLEMILK AND BUTTER FAT, AND THE VALUE OF SKIMMILK POWDER FOR CALF FEEDING PURPOSES AT VARIOUS PRICE LEVELS.

Net Price to the Producer for 3½% Milk	Maximum Price to Pay for 100 lbs. of Skimmilk Powder When the Price per Pound of Butterfat is:							
	25c	30c	35c	40c	45c	50c	55c	60c
\$1.00 per hundred.....	\$1.50							
1.25 per hundred.....	3.31							
1.50 per hundred.....	7.53	\$2.40	\$0.30					
1.75 per hundred.....	10.54	5.42	3.31	\$1.20				
2.00 per hundred.....	13.55	8.43	6.32	4.21	\$2.10			
2.25 per hundred.....	16.56	11.44	9.33	7.22	5.12	\$3.01	\$0.90	
2.50 per hundred.....	19.57	14.45	12.34	10.24	8.13	6.02	3.91	\$1.8
2.75 per hundred.....	22.59	17.46	15.36	13.25	11.14	9.03	6.92	4.8
3.00 per hundred.....	25.60	20.48	18.37	16.26	14.15	12.04	9.93	7.8
		23.49	21.38	19.27	17.16	15.06	12.95	10.8

FEEDING A DRY CONCENTRATE AND LIMITED WHOLEMILK

Dry Concentrate Containing Skimmilk Powder—Calves may be raised successfully by feeding wholemilk for a short time and gradually switching the calf to a dry grain mixture containing about 20 per cent dried skimmilk powder. Much labor is saved by feeding the dry mixture. The necessity of having hot water at feeding time is also dispensed with, there are no pails to wash after the first two months, and the danger of spreading digestive troubles is lessened. Under this plan the calf is fed wholemilk for 6 to 7 weeks. From the third week on the calf is induced to eat just as much hay and concentrate mixture as possible and the amount of wholemilk is cut down gradually. A dry grain concentrate, containing skimmilk powder, and other feeding stuffs, readily obtainable by the dairyman, is suggested as follows:

Ground yellow corn.....	30 lbs.
Ground oats (or rolled oats).....	30 lbs.
Skimmilk powder.....	20 lbs.
Wheat bran.....	10 lbs.
Linseed oil meal.....	10 lbs.
Total.....	100 lbs.

TABLE 5.—DAILY FEEDING SCHEDULE—DRY CONCENTRATES AND LIMITED WHOLEMILK.

Age of Calf	Wholemilk (lbs.)	Concentrate* (lbs.)	Hay
(Ayrshire, Gurensy and Jersey Breeds)			
Birth to 4 day.....	with dam		
2nd to 7th day.....	4-6		
1st to 2nd week.....	5-7	1/16	Free choice
2nd to 3rd week.....	6-8	1/16	Free choice
3rd to 4th week.....	7-9	1/4	Free choice
4th to 5th week.....	6-8	1/2	Free choice
5th to 6th week.....	4-6	3/4-1	Free choice
7th to 8th week.....	4-0	1 1/2-2	Free choice
8th to 12th week.....	None	Increase steadily to 4 lbs....	Free choice
12 to 16th week.....	None	4-5	Free choice
After 16th week.....	---	Change to regular grain mixture for heifers.....	

For Holsteins and Brown Swiss the amounts specified above should be increased approximately $\frac{1}{4}$ to $\frac{1}{3}$. At best these amounts are relative and calves will differ considerably in the amount of food consumed. Each calf must be treated as a separate individual and care used not to overfeed the slower growing calves, or to underfeed the faster growing more hungry calves.

The New Jersey Dry-Fed Calf Mixture—A successful and popular system of raising calves, where wholemilk is sold, has been suggested as a result of feeding trials at the New Jersey Station. By this plan the calves are fed wholemilk for three weeks, the wholemilk being gradually replaced by warm water, and are induced to eat a dry grain mixture and hay just as early as possible.

The dry-fed ration consists of the following ingredients:

100 lbs. yellow corn meal	50 lbs. soluble blood flour
150 lbs. ground oats	4 lbs. feeding steamed bone meal
50 lbs. wheat bran	4 lbs. finely pulverized limestone
50 lbs. linseed oil meal	4 lbs. salt

The feeding program is somewhat as follows:

- (1) *Birth to Three Days*—Suckle dam.
- (2) *Three Days to Three Weeks*—Wholemilk, not over 3 quarts per day. Start calf eating dry calf ration and hay.
- (3) *Three to Four Weeks*—Substitute 1 pound of warm water for each pound of wholemilk so that by the end of 30 days the calf will be living on the dry-fed mixture, legume hay and fresh water.
- (4) *One to Six Months*—At 30 days of age the calf should be eating nearly 1 pound of the dry grain mixture and hay free choice (about $\frac{1}{3}$ to $\frac{1}{2}$ pound daily). After the first month the dry grain mixture is gradually increased so that at the end of the fifth month the calf is consuming 5 to 6 pounds daily. Six pounds daily is the maximum to be fed regardless of breed. The calf will get the balance of the required nutrients from the hay which should be fed free choice and in liberal quantities.
- (5) *After the Sixth Month*—Discontinue the dry calf mixture and substitute a grain mixture for growing calves (see page 13). Silage may also be added to the ration.

Calf Meal Pellets—Commercial feed companies have in recent years placed upon the market "calf pellets" to be used in place of dry calf meals. In using calf pellets the same general plan is followed as in raising calves on a dry calf meal. It is claimed that calves like the pellets better than dry calf meal and therefore learn to eat them sooner and thus make better gains. This matter has not been sufficiently investigated by experiment stations to draw definite conclusions as to whether or not the pelleting is worth the extra expense. Where calf pellets are used the recommendations of the manufacturer should be followed in raising calves.

THE USE OF CALF MEALS

When skimmilk is not available the period of wholemilk feeding should usually be extended until the calf is about 4 weeks of age. The calf meal mix is then gradually substituted for the wholemilk so the calf is entirely on the calf meal ration by the time it is 6 to 7 weeks of age. There are available on the market a number of commercial mixed

calf meals, or the farmer may mix his own. A good calf meal should contain 25 to 30 per cent crude protein, 3.25 to 4 per cent fat, and not over 4 per cent fiber. Some protein from an animal source should be included. The following calf meals have given very satisfactory results:

I (Indiana)	II (U. S. D. A.)
Corn meal or hominy.....100 lbs.	Corn meal or hominy.....100 lbs.
Linseed meal.....100 lbs.	Linseed meal..... 30 lbs.
Red dog flour.....100 lbs.	Rolled oats..... 30 lbs.
Soluble blood flour.....100 lbs.	Soluble blood flour..... 20 lbs.
	Skimmilk powder..... 20 lbs.
	Salt..... 1 lb.

The calf meals are mixed with water in the proportion of 1 pound of the dry calf meal to 6 or 8 pounds of water, and the resulting gruel is fed in approximately the same quantities as skimmilk and with the same supplementary hay and grain feeds.

The general feeding schedule is as follows:

Birth to 14 days of age	Wholemilk.
14 to 28 days	3 parts wholemilk, 1 part gruel.
28 to 35 days	Wholemilk and gruel, equal parts.
35 to 42 days	1 part wholemilk, 3 parts gruel.
42 to 180 days	Gruel with usual grain feeds and hay.

Milk substitutes are never as satisfactory as either whole or skimmilk during the first few weeks of a calf's life and milk should be very high in price to justify their use at this time.

Calves raised by the calf meal plan are not usually as thrifty looking and in some cases are slightly smaller in size at six months of age than skimmilk calves, but at one year of age the calves are approximately normal in growth and development and under good feeding conditions cannot be discerned from the skimmilk fed calves.

Often the troubles encountered with calf meals or gruels may be traced to the use of low quality soluble blood flour. Only a high quality product should be used. Dried blood is not as satisfactory as soluble blood flour. The digestibility of soluble blood flour decreases as it is heated to unusually high temperatures. A soluble blood flour prepared at temperatures below 225 degrees F. is most desirable in this respect.

RAISING THE CALF ON WHEY

Good fresh sweet whey can be fed to calves with fair satisfaction if (1) the calf receives wholemilk long enough to get a good start (at

least one month); and (2) if plenty of animal protein is included as it is recognized that whey is low in proteins. The following mixture is suggested for feeding with whey:

Ground yellow corn.....	60 lbs.
Ground or rolled oats.....	10 lbs.
Wheat bran.....	10 lbs.
Linseed oil meal.....	10 lbs.
Skimmilk powder.....	10 lbs.

This grain mixture should be rubbed on the calf's muzzle and a small amount kept in the feed box so as to induce maximum consumption while the calf is young.

Whey, secured from creameries or cheese factories for feeding purposes, should always be pasteurized to prevent the introduction of disease into the dairy herd. This precaution, unfortunately, is often overlooked.

THE USE OF NURSE COWS

Some dairymen, particularly those engaged in the raising of high class purebreds, prefer to use nurse cows to furnish wholemilk during the first few weeks of the calf's life, which generally results in sleeker, healthier calves. Trouble with scours, often caused by the calf gulping milk too fast, "pot-bellied" calves, and contaminated feed pails are eliminated with this plan. Many who use the nurse cow plan claim there is less work involved than in bucket feeding.

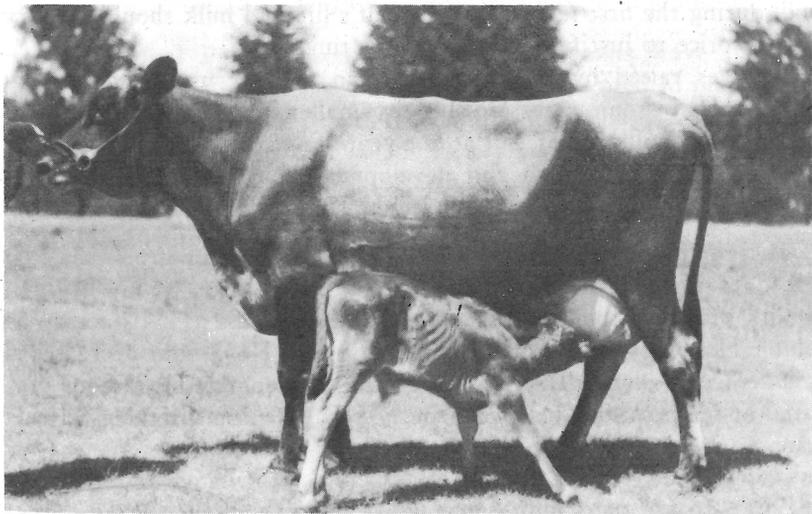


Fig. 2.—Raise only calves sired by well bred bulls, and out of the best cows in the herd.

One nurse cow can handle two to four calves at a time. Each calf should get 8 to 10 pounds of milk per day, and until they are 50 to 60

days of age they should be allowed to suckle two or three times daily. After the calf is two months old it should be with the nurse cow only once a day until weaned.

By the time the calf is two weeks old it should have access to hay and a dry grain mixture similar to the following:

Yellow corn meal.....	20 lbs.
Ground or rolled oats.....	20 lbs.
Wheat bran.....	20 lbs.
Linseed oil meal.....	20 lbs.
Skim milk powder.....	20 lbs.

Salt, or a mixture of equal parts of salt and steamed bone meal should be kept before the calves at all times. Fresh water should also be provided after the calf is a few weeks old.

Quarters and Stanchions for Dairy Calves.—It is best to keep the calves by themselves for the first two or three weeks. Real young calves should never be bumped and jostled about, and the only way to prevent this is to have small individual pens for them. These pens should always be dry and well bedded. By the time the calf is two or three weeks old it is well to turn it in with other calves in a large pen. These large pens should always have stanchions fixed on one side so that the calves can be shut in and each calf will get its share of the feed.

It is almost impossible to feed calves right where they are kept in a large pen unless they are fastened at feeding time. They are likely to spill the feed and the larger calves will take feed from the smaller ones. Also, to prevent calves from suckling one another, it is well to keep them in these stanchions for a while after feeding them.

A simple calf stanchion can be made from scrap lumber in very little time and with little expense. In the long run, it will save a great deal of time in feeding calves and will enable one to raise better calves because they will all get just what feed they need and no more.

It is of very great importance that the quarters for calves be light and dry. Plenty of bedding should be furnished and changed often enough to keep the pens dry all of the time. After the calves are a few weeks old, they can stand quite a bit of cold if they are dry. Darkness or dampness or both are very likely to cause any one of numerous calf diseases.

The calves should have a lot to exercise in. They should be turned out at least once every day except on the most stormy days.

The accompanying picture will be of assistance in making stanchions.

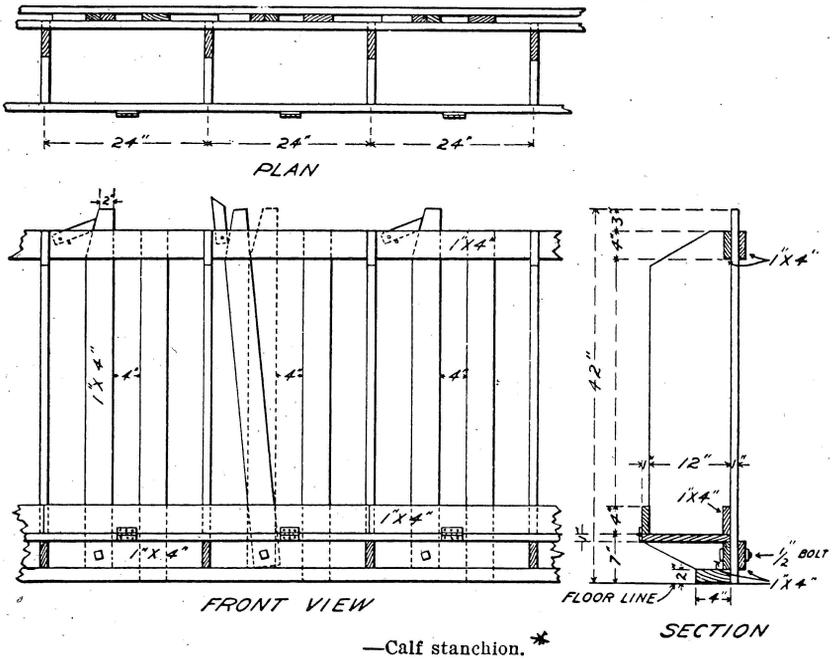


Fig. 3.—Diagram showing how to make a calf stanchion. (Courtesy U. S. Department of Agriculture.)

Dehorning

Dairy cattle not intended for show may well be dehorned. As a rule calves should be dehorned when one to two weeks old. The most satisfactory way is to use caustic potash for the purpose, as it kills the growing horn, and cattle breeders who prefer to have their cattle dehorned find it less trouble to prevent the growth of horns than to remove them later.

To prevent the growth of horns, first clip the hair from a small area around the horn button. Next, encircle the clipped area with vaseline or axle grease to confine the action of the caustic potash to the area of the horn. The final step is to rub the horn button with a stick of moist caustic potash until the skin is ruptured and begins to bleed slightly.

Excessive amounts of potash should not be used as the horns of young calves are easily killed. The caustic should not be too moist, for if it runs over on the surrounding skin or into the eyes, much unnecessary pain is caused. Immediately after treatment, calves should be protected from rains, to prevent the caustic from spreading.

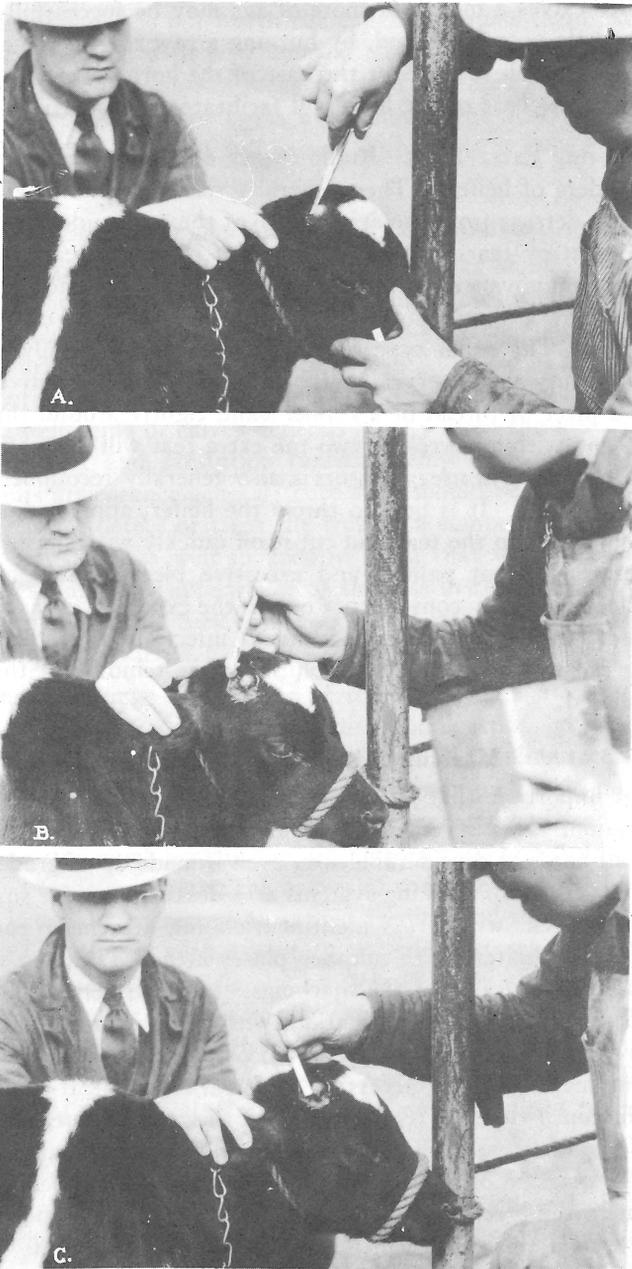


Fig. 4.—STEPS IN DEHORNING THE DAIRY CALF.

- A. Clip the hair away from the small horn or "button."
- B. Apply grease around the horn to prevent the caustic from spreading.
- C. Apply the caustic directly to the base of the horn.

Heifer calves a month or more of age may be successfully treated by the caustic potash method, by burning a raw ring in the skin from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch wide about the base of the horny growth. Clipping hair around the base of the horn will facilitate the operation.

Removing Extra Teats—Rudimentary or extra teats often appear on the udders of heifers. They generally secrete no milk but are unsightly and detract from the appearance of the cow's udder. Occasionally rudimentary teats appear as a part of the main teat, and are of considerable annoyance in milking. Such teats are hard to remove and at best require a surgical operation within the scope of only a good veterinarian. The usual type of rudimentary teat is easily removed, however, by any one of several methods. A simple but effective method is to tie a piece of thread or a rubber band tightly around the base of the teat, and within a week or two the extra teat will drop off, leaving a healed wound. The use of scissors is also generally recommended and gives good results. It is best to throw the heifer, apply iodine or any good disinfectant to the teat and cut it off quickly with sharp scissors. The operation is not painful and excessive bleeding seldom occurs. Where bleeding of any consequence occurs the exposed vessels should be cauterized. Care must be used to avoid infection from the scissors. Painting the wound with iodine solution after removal of the teat is recommended.

Marking Calves for Identification

It is important that each calf be plainly marked to permit easy identification. This is very necessary in purebred herds and should be done in all herds of considerable size, even if made up of grades. Some of the most common marking systems are—leather strap or small chain around the neck, with brass identification tag attached; ear tag of various forms; halters with number plates attached; tattoo marks in the ears; and diagrams of the markings. In some herds photographs are used as a means of identification, with excellent results. In purebred herds it is a good idea to diagram or photograph each calf quite early and make out the necessary registration application and hold this on file until time for registration. In the case of Guernseys where it is the usual custom to file a birth report before the animal is 30 days of age, the diagram of the animal should be made in duplicate and one copy sent to the breed association as a part of the birth report and the other kept as a means of identifying the animal in the herd.

Free-Martins

Many twins in cattle consist of a male and a female; in such cases the female is called a free-martin and in about 90 per cent of the cases is sterile. Occasionally these females breed, but at best it is about a

9 to 1 chance, and it is not worth the expense to raise them except in the case of an animal with very unusual blood lines.

There are many mistaken ideas as to the breeding ability of cattle twins. With opposite sexed twins even though the female is sterile, the male is not affected and will breed. Twin bulls or twin heifers will breed the same as any singly born calf.

Some Common Ailments of Dairy Calves

Calves, particularly during the first few weeks of life, are subject to a few common ailments. In some cases diseases causing a high mortality are encountered and often the calves surviving are subject to general unthriftiness and poor growth.

Prevention is the best treatment of calf trouble. The general health and well-being of calves depends largely upon the feeding, care, and management and sanitation measures employed. When disease does make its appearance general "cure-alls" should be avoided. If the herdsman cannot detect or treat the trouble a competent veterinarian should be called. It is well to keep in mind that many diseases are rapidly spread and any appearance of sickness in the calf herd should be dealt with promptly. Sick calves should be isolated at once and the proper treatment rendered.

Common Scours—The causes of common scours are many, but usually they are confined to factors causing indigestion. Symptoms of this disease are a looseness of the bowels and foul smelling feces. Over-feeding, drinking milk too fast, separator foam on milk, cold milk, sour milk, dirty feeding pails or troughs, sudden changes of feed, feeding freshly cut or too much legume hay, fresh green grass and moldy, heated or damaged feeds are among the causes of common scours. This form of scours is usually corrected by proper feeding and management and should not be confused with dysentery or "infectious white scours."

The calf should immediately be isolated from the remainder of the herd. Treatment consists of (a) reducing the amount of feed immediately, also any faults with the milk such as too cold, sour, dirty, or from garget affected cows should be corrected; (b) give the calf about a half teacup of mineral oil to which has been added $\frac{1}{2}$ to 1 tablespoonful of a mixture consisting of two parts bismuth-subnitrate and one part salol. One to four tablespoonfuls of castor oil given in the milk may also be used, but the bismuth-subnitrate and mineral oil is preferable. If the calf does not improve, as in case of a severe attack, the bismuth-subnitrate-salol-oil mixture should be repeated every 6 to 12 hours, the amount given varying with the age and size of the calf. In severe cases, raw eggs broken into the milk are helpful; (c) the calf should be brought back on feed slowly, feeding one-half the usual amount of milk after the oil treatment, and gradually increasing the

allowance of milk as the calf progresses. (d) All pails and utensils utilized in feeding must be sterilized. The addition of $\frac{1}{2}$ to 1 ounce of limewater per pint of milk fed is often helpful during the time the calf is recovering.

II. FEEDING AND CARE OF THE DAIRY CALF FROM SIX MONTHS TO ONE YEAR OF AGE

Heifers over six months of age are comparatively easy to care for but should not be neglected. At this age the heifer is growing rapidly and responds to good care and management by very economical gains in body size during this period. Studies at the Missouri Agricultural Experiment Station (Bulletins 336 and 338) show very clearly that neglecting the feeding of calves between 6 and 12 months of age results in an increased growing cost. Heifers should not be kept fat but rather growing rapidly so as to be sufficiently developed to be bred for freshening at the normal age for the breed.

From 6 months to 1 year of age the heifer may be fed mostly on roughages, including pasture, with a moderate amount of grain. During the summer months green pastures furnish excellent and well balanced feed for growth. Unless the pasture is unusually good, however, a little grain feed is recommended, and this is most important for extremely young calves, 6 to 9 months of age. Early in the spring, during hot, dry weather, and during the fall months when pastures are short, hay and silage in addition to grain should also be provided. Heifers



Fig. 5.—Heifers over six months old may be raised principally on good quality roughages.

from 6 to 12 months of age will eat from 5 to 10 pounds of hay daily and from 5 to 15 pounds of silage, the silage replacing some of the hay. Legume hays such as alfalfa, clover, soybean and cowpea, or a mixture of these hays and non-legumes, is excellent for growing heifers. This form of roughage is rich in minerals and vitamins necessary for growth. Roughages may very satisfactorily be fed free choice and just enough grain supplied to keep the heifers growing well. Where plenty of legume roughages and silage are available a grain mix consisting mostly of corn and oats is desirable. Suggested mixtures are:

I	II
Ground corn.....300 lbs.	Ground corn.....400 lbs.
Ground oats.....200 lbs.	Ground oats.....200 lbs.
Wheat bran.....100 lbs.	Wheat bran.....100 lbs.
	Linseed oil meal.....100 lbs.

Where only non-legume roughages such as corn stover, timothy hay, straw, etc., are available, a grain mixture higher in protein than the above should be fed. In such cases one of the following rations will be satisfactory:

I	II
Ground corn.....100 lbs.	Ground corn.....200 lbs.
Ground oats.....100 lbs.	Ground oats.....200 lbs.
Wheat bran.....100 lbs.	Wheat bran.....100 lbs.
Steamed bone meal..... 3 lbs.	Linseed oil meal.....100 lbs.
	Steamed bone meal..... 6 lbs.

Alfalfa and Skim milk—Heifers may be raised satisfactorily to the age of approximately 2 years on a ration of skim milk and good quality alfalfa hay. In experiments now in progress at the Missouri College of Agriculture, it has been found that heifers fed skim milk and leafy green alfalfa hay to 9 months of age and then continued on the alfalfa alone are approximately 96 per cent as large in body framework as the normal heifer at 18 months of age. In body weight the heifers are about 11 per cent below normal, indicating a lack of energy in the alfalfa ration. The heifers are very thrifty and healthy in appearance, however, and when fed the usual ration supplied cattle of near freshening and milking age will add sufficient weight to closely approximate normal.

The amount of hay consumed per pound of body gain has been approximately equal to the amount of grain and hay combined consumed by calves fed the usual way. The cost of growing the heifers has been reduced considerably, however, through the substitution of roughage for the grain. This plan offers considerable promise for the breeder who has an abundance of skim milk and legume hay.

Water and Salt—Growing heifers require plenty of water and salt. Salt may be fed as a part of the grain ration and in addition should be available at all times in the pasture or exercise lot.

Age for Breeding Heifers—The age at which heifers are bred depends upon their growth and development. Jerseys and Guernseys mature somewhat earlier than Holsteins, Ayrshires and Brown Swiss, and should usually be bred at 15 to 18 months of age. Holstein, Brown Swiss and Ayrshire heifers should usually be bred at 18 to 19 months of age. Delay of breeding past the recommended age where a heifer has attained normal development and growth is not usually justified by a sufficient increase in production to warrant the practice. On the other hand, a small weak heifer should not be bred until she has attained approximately normal size. The strain of lactation after a small, weak heifer has freshened usually retards growth to a considerable extent.

III. CARE OF THE BRED HEIFER FROM ONE TO TWO YEARS OF AGE

Feeding.—In feeding calves from one to two years old, a good ration of roughness will usually be sufficient. Feed them all the corn silage and good legume hay they will clean up and they will thrive on it. A liberal ration of good roughness is desirable at this time for two reasons. First, it is desirable to develop an animal of good size and plenty of capacity for handling food for milk production later. Second, a good, well balanced roughness of this kind is practically as good for the dairy heifer at this age as grain, and the food supplied in the roughage is much cheaper.

As a rule, more harm results from underfeeding in the summer than in the winter. As long as pastures are good in summer, the heifers usually will fare all right, but when the summer droughts come and the pastures begin to get short, the heifers suffer. Always plan to have a little good, green forage to feed the heifers at such times. A little patch of cane and Canada field peas or some good forage will prove a money maker.

It is seldom that the animal will need grain at this age. However, the animal should be kept in reasonably good flesh and in good growing condition. If it becomes necessary to feed grain in order to do this, a mixture of equal parts of crushed corn and crushed oats will be found to be a good economical ration.

Always give the calf free access to plenty of good fresh water and salt. The importance of this point cannot be over-emphasized.

Breeding.—The age at which it is best to breed the heifer depends somewhat upon the breed and upon the development of the particular heifer.

As a rule, a Jersey or Guernsey should be bred at 15 to 18 months of age. At this age, she should weigh about 600 pounds. A Holstein should usually be bred at 18 to 19 months of age and should weigh

about 800 to 850 pounds at that age. The Guernsey is a little larger than the Jersey and should possibly be bred just a little later. Do not get discouraged if the heifer is a little smaller than the average for the breed at this age. Some cows develop more slowly than others and it is the nature of some cows to be small. That does not mean that they will not show up just as well and be just as good producers.

The club member should be especially careful in selecting the bull to which the heifer is to be bred. Do not be satisfied with anything but a registered bull of the same breed as the heifer. Use a bull of that kind if you have to go several miles to him. If possible, breed to a bull with a good pedigree behind him, one whose dam made an official record and whose other ancestors show good breeding. Then you will get a calf from your heifer that will be worth a good many times what a calf from a "scrub" bull would be worth. After you have had your heifer bred, keep her shut up in a boxstall or small lot by herself for the rest of the day.

Make it a practice from the start to keep a record of breeding dates. Then you will know what time the heifer will calve.

Indigestion.—Indigestion in cattle is generally caused by eating damaged feed, or changing quickly from one kind of feed to another. It may also be caused by the animal's not getting enough water or from drinking very cold water. It is indicated by loss of appetite, bad odors or a dull sluggish action. One should immediately take away all feed except good silage, roots or grass and a little bran or similar laxative feed. Then, give one pound of glauber's or epsom salts dissolved in two quarts of warm water. If necessary, repeat the dose in a day or two.

Inflammations.—For inflammations or serious bruises of any kind, frequent applications of Antiphlogistine, or "Denver Mud", as it is commonly called, will give relief. This is especially true of caked or inflamed udders just after calving. In the case of caked udders, it is often well to leave the calf with the cow for a day or two just after calving. Frequent milking and cutting down the grain ration or changing to a ration of light palatable feed, such as bran and oil meal, will also give relief.

Sore Feet, Cuts, Open Wounds, etc.—The best policy with such troubles is to clean out the sore or wounds, keep them clean and disinfect them. A 3% to 4% solution of carbolic acid makes a good disinfectant. Sore feet are often caused by the heifer's having to stand in a filthy barnyard. In such cases, there is no hope of healing the feet until they are taken out of the filth and kept clean. Clean the feet well and disinfect them and turn the heifer into a clean lot or pasture. Or, if it is winter and impossible to do this, give the heifer a good clean, roomy box-stall in the barn. Keep her there, keep the stall clean and give her plenty of bedding. Clean the sore out and disinfect it every few days until it is well.

Nervous Heifers.—Some heifers are naturally inclined to be timid and more or less wild. Such heifers, if allowed to follow their natural inclination, will usually become more wild and before long will be jumping fences. On the other hand, with a little special petting now and then they may become the tamest animals on the place. If the heifer seems a little timid at times, give her a little special notice, and an extra handful of grain or something of the sort to make her feel that she is one of the herd.

IV. KINDS OF RECORDS TO KEEP; TESTING MILK FOR BUTTERFAT

Breeding and Calving Records.—It is always advisable to keep records on the breeding of all cows as well as the dates of calving. If you have the breeding dates in hand, you will know just when to expect each cow to calve and will often be saved the loss of a calf, and will also be aided materially in the sale of calves. The records are an item which it is very little trouble to keep but which may mean quite a little to the dairyman. Breeding dates and calving dates are required before you can register any animal.

Feed and Other Cost Records.—One advantage in keeping feed and other cost records on your cow is that you will know at the end of the year just what your cow has cost you. Then by checking up with your production records, you will know just what your profit or loss is and whether or not it will pay you to keep her. Another advantage which feed records have is that you then have a way of knowing just what you have fed and what effect certain feeds have had upon the production of your animal. In this way, you will soon find what feeds are best to give your cow and the best way of handling her.

Milk and Butterfat Records.—The importance of keeping production records cannot be over emphasized. Very little time is required. All that is necessary is to hang a pair of scales in the barn just back of the cow's stanchion and tack a monthly milk sheet up on the wall. Then each time after you get through milking your cow, weigh the milk and record the weight. Some time during the month, take a sample of night's milk and a sample of morning's milk, mix the two and test it. This will give you a fair average test for the month. At the end of the month, take down your milk sheet, total it and apply your test to the total of milk to get the pounds of butterfat for that month. Then by taking the average price of butterfat produced for the month, you can determine the value of the fat produced by your cow during the month. Add the value of the skimmilk to the value of the fat to find what your cow was actually worth that month. Keep this up for a year and with your feed records you will know just what your cow is capable of doing and you will know what she is worth. Cows are coming more and more to be bought and sold on the basis of what they actually produce.

Another point in favor of keeping records is that you have something by which to gauge your feeding. Many cows could profitably be fed more, while others are being given more feed than they have any need for. If you are keeping records, you can feed accordingly and avoid this loss. Also, if a cow is going "off feed" or is sick from any other causes, she almost invariably shows it in her milk flow. If you are weighing the milk, you will notice this much more readily than otherwise and in that way can "head off" any trouble that may be coming on.

Sampling.—For ordinary testing work, it is usually customary to take a sample of night's and morning's milk; mix the two and test the composite. In taking a sample, stir the milk well with a dipper and fill a one-half pint bottle one-third full. Then for the next milking, repeat the operation, filling the sample bottle about another one-third full.

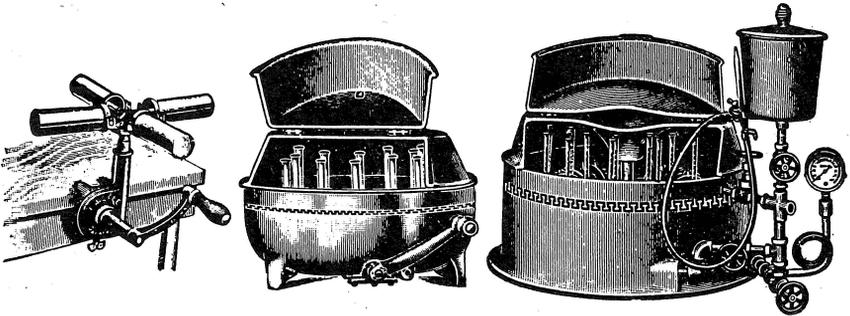


Fig. 6.—Various types of Babcock testers. Reading from left to right; the 4-bottle hand tester, the 12-bottle hand tester, and the 12-bottle steam tester.

Testing.—Warm (or cool) the milk and acid to about 60° F. (If you get it much warmer it will charr when the acid is added.) Mix the milk well by pouring from one bottle to the other. Then by suction, draw 17.6 cc. (cubic centimeters) of milk into a pipette (up to the mark on the neck) and insert it into a milk test bottle. Measure out 17.6 cc. of sulphuric acid in a measure and pour it down the neck of the test bottle. Shake the bottle with a whirling motion until the whole solution takes on a coffee colored appearance. Put it in an ordinary milk tester and turn it at the rate of about 80 turns per minute for five minutes. This gives about 1,080 revolutions per minute inside the tester. Add water at 130° to 140° F. up to the neck of the bottle and turn for two minutes longer. Then add water up nearly to the top of the graduated part of the bottle and turn for one minute longer. Take the bottle out and set it in a hot water bath at 130° to 140° F., being careful that the water comes as high as the top of the fat column along the graduated

neck of the bottle. Always read from the top of the meniscus, at the top of the fat column.

The acid added to the milk breaks or burns up the fibrin in the milk and releases the fat globules. Then the whirling centrifugal motion brings the lighter fat globules to the top and the heavier parts sink to the bottom of the solution.

Always keep the utensils clean. Cleanliness is essential to accurate testing.

V. FEEDING CONSTITUENTS FOR THE COW

In studying the ways to feed cows and the kinds of feeds to give them in order to make the most profit from them, we should remember first that feeds contain a number of different types of constituents. Among these are water, mineral matter, protein, and energy feeds or carbohydrates and fats.

The cow's body is also made up of these four constituents and she must have a certain amount of each to keep her alive. The water is found in the blood and throughout the entire body. The mineral is mostly lime and phosphorus and is found in the bones hoofs, hair, skin and to some extent in the blood. Protein is found mostly in the muscles, bones, skin and hair, while the fats are found largely in the fatty portions of the body. Milk also contains a certain amount of each of these four constituents, though they are all in solution and we cannot separate them except by chemical analysis.

Now it happens that some feeds are very high in one of these constituents but are low in others. Some may contain a large amount of two kinds of constituents but no cow feeds contain just the right amount of all of them. For instance, corn contains a great deal of energy feed like carbohydrates and fats but contains very little mineral and protein. On the other hand, soybean hay contains a great deal of both protein and mineral matter. It is absolutely impossible for the cow to make any one of these take the place of another. If we feed too much of one and not enough of another then the surplus of one will go to waste because we didn't have our feeds balanced and besides we will not get as much production and profit from the cow as we should. Then what we want to learn is which feeds serve each purpose and how much of each to feed. In order to do this, we shall take up each of these constituents as we have named them.

The Water Supply.—It seems strange that it should be necessary to mention this since a liberal supply of pure fresh water is available with little or no effort or cost on the average farm. Yet it is a fact that the profits from cows are very materially reduced on a great many farms

simply because cows do not get enough pure water. Since 56 per cent of the cow's body is made up of water and 87 per cent of her milk is water, we should readily see that she needs to consume large quantities of it. An ordinary cow will drink about 12 gallons of water a day and a real high producing cow needs more.

A cow should have all the water she wants and should have it as often as she wants it. This water should be clean from a running stream or spring, or direct from a well. A stagnant pond is not only a source of filth but is likely to be dangerous as a disease spread at any time.

This water should be at a reasonable temperature. No cow can drink enough ice water to maintain her body and produce a reasonable flow of milk. If the cows are being watered from a tank in the winter time, it will always be found economical to arrange a tank heater or other means of bringing the water up to at least the temperature at which it comes from the well before watering them.

Mineral Feeds for Cows.—As was mentioned in the last discussion, the cow needs feeds that contain mineral matter to keep up her bones, teeth, and masculine tissues as well as to make milk. Milk contains a great deal of mineral and especially lime. A quart of milk contains as much lime as 30 pounds of beef, or 23 pounds of potatoes, or 11 loaves of white bread. Milk contains a great deal more lime and mineral matter than any other common human food. We need this lime to make teeth, bones and muscles and most people who drink plenty of milk from infancy are strong and have good teeth for this reason.

But the cow must be provided with feeds that contain plenty of mineral matter if she is to have them from which to make milk. The most important mineral is lime.

THE AMOUNT OF LIME IN DIFFERENT FEEDS

Kind of Feed	Pounds of Lime Per Ton of Feed
Alfalfa hay.....	71 Pounds
Soybean hay.....	48 Pounds
Red clover hay.....	60 Pounds
Corn stover.....	23 Pounds
Wheat straw.....	6 Pounds
Millet.....	15 Pounds
Timothy.....	13 Pounds

From this table we see at a glance the importance of alfalfa, soybeans and clover as a source of mineral matter for the cow. The cows should

always have all of one of these kinds of hay that she will clean up once a day during the entire feeding season.

Salt is another mineral which should be mentioned. A cow should always have all of the salt that she wants. For a cow in milk, this will vary from one to two ounces a day. She may be given free access to it or it may be mixed in the grain ration at the rate of one pound of salt to every 100 pounds of grain mixture.

Protein Feeds.—Proteins are the kinds of feed that go mostly to build up muscles and lean meat. Quite a bit of protein is also found in the bones, hair, skin, and other parts of the body. Milk also contains very large quantities of protein which is another reason why it is such a good human food.

A cow must have a liberal supply of feeds that contain protein in order to be a good milk producer. It takes seven-tenths of a pound of protein a day just to keep a 1,000-pound cow alive. In addition to that, she needs about half-a-pound of protein for each gallon of milk she produces. So we should know just what feeds are highest in protein and should furnish her with enough of them. Some common feeds with the amounts of protein they contain are shown at the bottom of this page.

From this we see very readily that among roughage feeds, alfalfa, soybeans, and clover are our very best sources of protein. Also, our grain

Amount of Digestible Protein in Different Feeds

Kind of Feed	Pounds of Digestible Protein in each 100 Pounds of Feed
Soybean hay.....	11.1Pounds
Alfalfa hay.....	10.6Pounds
Clover hay.....	7.0Pounds
Orchard grass.....	4.6Pounds
Timothy hay.....	2.9Pounds
Corn stover.....	2.2Pounds
Corn silage.....	1.1Pounds
Wheat straw.....	0.8Pounds
Soybean oil meal.....	37.7Pounds
Cottonseed meal.....	37.0Pounds
Linseed oil meal.....	30.6Pounds
Soybean seed (crushed).....	33.8Pounds
Wheat bran.....	13.1Pounds
Ground oats.....	9.4Pounds
Ground corn.....	7.1Pounds
Corn and cob meal.....	6.0Pounds

LET YOUR ROUGHAGE BE YOUR GUIDE

	Non-Legume	Mixed	Legume	Pasture
With this kind of roughage → feed	Corn silage, corn stover, oat hay, cane, timothy, soybean straw, sudan, or other non-legumes.	Corn silage, stover, cane, timothy, or other non-legumes, with alfalfa, clovers, soybeans or cowpeas.	Cowpeas, soybeans, alfalfa or clover.	Sweet clover, Korean, sudan, barley, wheat, rye bluegrass or other permanent pasture.
↓				
This mixture of grain →	Ground corn..... 400 Wheat bran..... 300 Cottonseed meal..... 300 Steamed bone meal..... 20 Salt..... 15	Ground corn 600 Wheat bran..... 250 Cottonseed meal..... 150 Steamed bone meal..... 15 Salt..... 15	Ground corn..... 600 Ground oats..... 200 Wheat bran..... 200 Steamed bone meal..... 10 Salt..... 15	Ground corn..... 700 Wheat bran..... 200 Cottonseed meal..... 100 Steamed bone meal..... 15 Salt..... 15
Approximate protein content.....	Crude.....20.0 Digestible.....16.5	Crude.....16.0 Digestible.....12.5	Crude.....11.0 Digestible..... 8.5	Crude.....14.5 Digestible.....11.5
Amount to feed.....	Feed Jersey or Guernsey cows 1 lb. of grain for each 3-4 pounds of milk produced. Feed Holsteins, Brown Swiss or Shorthorns 1 lb. of grain for each 4-5 pounds of milk produced.			Jersey or Guernsey 1 lb. feed to each 4-5 lbs. of milk produced. Holstein or Shorthorn 1 lb. feed to each 5-6 lbs. of milk produced.
Substitutes for corn.....	Corn and cob meal, barley, hominy feed, pound for pound. Up to 50% of the corn may be replaced and an equal weight of ground wheat sorghum Grains or blackstrap molasses.*			
for bran.....	Oats, alfalfa meal, or wheat middlings, pound for pound.			
for cottonseed meal..	Linseed oil meal, gluten meal, soybean oil meal, crushed soybeans, pound for pound.			

*Blackstrap molasses is palatable and much relished by dairy cows. Molasses may be poured on the grain feed direct in the manger at feeding time. When poor quality of roughage is used the molasses may be added directly to the roughage and thereby increase its palatability.

feeds, soybean oil meal, cottonseed meal and linseed oil meal are our best sources of protein.

It is worth while to mention here that protein and mineral matter are the two kinds of feed of which we are short on nearly all Missouri farms. These are feeds that can be supplied very cheaply through home grown soybeans, clover or alfalfa, and if grown and fed will very greatly increase the profits from the average herd. Any club boy who does not have some one of these hay crops at home, will do well to raise a little of one of them along with his dairy club project.

Energy Feeds.—The last constituent to which we previously referred, was the carbohydrates and fats or energy feeds. These are usually referred to as energy feeds because they furnish energy and heat for the body. They include feeds which contain plenty of fat, starch and sugar. They are needed to maintain the fatty portions which are found to a greater or less extent throughout the body. Milk also contains a great deal of fat as well as plenty of milk sugar. These feeds are needed to furnish the fat and the milk sugar to go in milk.

VI. CARE OF THE HEIFER AT CALVING TIME;

Some time before calving, the heifer should be moved to the barn and to the stall where she is to be kept permanently. The cow is very nervous at the time of calving and will be less excitable than if she has become somewhat accustomed to her permanent quarters. You should have a breeding record so that you will know just when your cow is due to calve. A few days before this she should be removed to a good large box-stall. Keep the stall clean and supplied with plenty of clean bedding.

Just at this time the cow is very low in vitality and should be given especial care. If it is cold weather, she should have a good warm stall free from all draughts. It is well to warm her water for a few days at least and she should have only a light, palatable ration. A good allowance of bran or beet pulp in the ration is advisable to see that the cow's bowels are in good shape. One should be especially careful not to let the cow become constipated at this time.

Just before the time of calving, the hind quarters of the cow should be washed thoroughly with soap and water and then bathe the rear end of the cow with a 1% solution of lysol. This is done to reduce to a minimum the possibility of the new born calf picking up a navel infection. Immediately after the calf is born take a fruit jar lid or some other container that does not have a sharp edge, and preferably one a little larger than a fruit jar lid, fill it with tincture of iodine, such as you would purchase at any drug store, if the navel cord is too long clip it off and then press the container of iodine over the navel holding it there for one minute.

A large amount of the loss of calves from white scours and other stomach disorders is due to the calf picking up an infection through the navel during the time it is born or within a few hours after it is dropped. The practices suggested here will almost eliminate the danger of this type of infection.

Just at the time of calving, the cow may need help, especially in the case of the heifer. In case of improper presentation of the calf, it is best to call a veterinarian at once. However, the calf may be properly presented and still the cow not be able to deliver it. The calf should be presented front feet first with the head between the feet. In this case it is well to help the cow yourself by pulling the calf from her.

It is well to let the calf run with the cow for three or four days. It is usually best, however to take the calf away and milk the cow three or four times a day until the inflammation is gone from the udder. Feed mostly light feed until the inflammation is out of the udder and she has regained her normal strength.

VII. FEEDING THE COW BEFORE AND AFTER FRESHENING

The amount of milk that a cow will produce during her lactation depends greatly upon her condition at freshening time. A cow should rest from 6 to 8 weeks previous to her calving period. Proper feeding during this dry period is just as important as is proper feeding during the lactation period. She should be provided with good pasture or fed hay and silage at approximately the same rate as to milking cows.

The same grain ration recommended for the milking herd or the dry cow grain mixture suggested in this Circular may be fed in such amounts as required to get or keep cows in good condition until about one week before calving. The amount of grain fed will vary from 2 to 8 pounds per day depending on the condition of the cow.

About one week before calving one-half, or more, of the grain mixture should be replaced with bran. Beginning about the third day following calving the grain ration can be changed back gradually to the regular grain mix. The amount of grain fed may then be increased slowly until the cow is on full feed. Avoid heavy feeding during this period.

A suggested dry cow ration

Ground corn	800 pounds	Soybean meal	75 pounds
Ground oats	600 "	Bone meal	25 "
Wheat bran	400 "	Salt	25 "
Cottonseed meal	75 "		

Linseed meal may be substituted for a portion of the cottonseed meal and the soybean meal when available at similar prices.

Judging

The following score card should be used during the dairy club tour to assist in an intelligent inspection of the dairy calves.

DAIRY CATTLE JUDGING—PLACING CARD

Class						
Points for Comparison	Points Allowed	1	2	3	4	Grade
<i>Type, Size and General Appearance:</i> Breed type and character; full size for breed; depth, width and length of body; straightness of lines; style; balance and symmetry.....	25					
<i>Dairy Conformation and Dairy Temperament:</i> Angularity, tendency to leanness; absence of beefiness at neck, withers, brisket, back and thigh. Clean-cut thruout, quiet and gentle disposition with well controlled nervous system	20					
<i>Mammary System:</i> Size, attachments, shape and quality of udder; size and placement of teats; development of milk veins and veining of udder; size and number of wells	35					
<i>Health, Constitution, and Feeding Capacity:</i> General condition; brightness of eye, quality of hair and hide, depth and width of chest, fullness of crops, length, width and depth of barrel, spring of rib, development of muzzle and jaw	20					
Total Score	100					
Final Placing Order						

Method of Judging Dairy Cattle.—If one expects to become a good judge of dairy cattle, the first step is to make a careful study of the correct form or type and by so doing to fix in mind a picture of the ideal animal. This can best be accomplished through the use of ideal type models or pictures and through use of slides or pictures of representative animals of the different breeds. The next step is to train the eye properly to compare the animals to be judged and to ascertain the deficiencies as compared with the mental picture of the ideal animal.

It is essential in all types of judging that the club member first familiarize himself with the different parts of the dairy animal and their correct form.

Milk production is the primary function of the dairy cow, and dairy judging is based on the fact that there is a correlation between the form

of the animal and her ability to produce milk. Though there are certain particular characteristics common to one breed alone, such as color, size, and special conformation of the body, the chief characteristics of the dairy cow are common to all breeds and may be termed the essentials of a dairy cow. A general score card, listing those points and ascribing a definite numerical value to each, has been prepared. It lists and describes each part in groups under the following heads:

1. Style and general appearance.
 2. Dairy conformation.
 3. Constitution.
 4. Capacity for feed.
 5. Development of milk secreting organs.
- (See score card. Page 31)

Procedure in Judging.

1. Get breed type firmly fixed in mind. Try to visualize the ideal type animal when placing a ring of animals.
2. Be systematic in inspecting a class.
 - a. Make good use of the few minutes spent in comparing the animals at a distance or while moving. That is the best time to compare breed type, general lines, blending of parts, balance, symmetry, and carriage; also length and depth of barrel, body size, and squareness and levelness of udder.
 - b. After classes are lined up, first pass along behind the class observing:
 - (1) Spring of rib and capacity of barrel.
 - (2) Width between hip points and between pin bones and width of loin.
 - (3) General clean-cutness and degree of refinement.
 - (4) Sharpness at withers and fullness of crops.
 - (5) Height of rear udder attachment and uniformity of development between teats.
 - c. Move along in front of ring observing:
 - (1) Heads and necks—breed type and character—constitution.
 - (2) Width of chest floor.
 - (3) Spring of fore ribs.
 - (4) Fineness of withers and general blending of body parts throughout.
 - (5) Clean-cutness and degree of refinement.

- d. Spend enough time in close inspection and handling to determine:
- (1) Handling quality or texture of udder, and size and spacing of teats.
 - (2) Size of milk veins and milk wells.
 - (3) Quality of skin and hair.
 - (4) Openness of ribs and backbone.
 - (5) General dairy temperament.
3. In drawing conclusions and making placing *keep in mind*:
- a. The approximate value given to different parts on the score card and balance the points to the best of your judgment, remembering for example, that a cow having a badly tilted or ill-shaped udder would place below a cow having desirable udder, even though the first mentioned cow is superior in fineness of withers and quality of hide, other things being equal. On the other hand, remember that there are many different degrees of any fault and that for example, in the case mentioned above, the first cow might have a slightly tilted udder and yet place above the cow having a good udder because the first mentioned cow has a much neater wither and greater quality of hide.

Judging Young Dairy Stock.—In judging immature classes, the same things are looked for as in mature animals, but as some of the most important points are not developed in the young animals, the indication for development must be taken into consideration. This is particularly true of the mammary development. The younger the animal, the less development of udder and veins is to be expected, but several things to be considered indicate future development.

In judging a class of young heifers, the udder should be examined carefully for uniformity of quarters and teats, length and width of udder, rear and fore attachments and quality of udder. Close examination will also reveal the length and tortuousness of the milk veins.

In dairy conformation, the same refinement is looked for as in older animals, although care must be taken to differentiate between animal in good condition and a tendency toward beefiness, as young animals are generally in good condition. Springing heifers that have been properly fed usually carry much fat and are sometimes said to be coarse over the withers when this is due to accumulation of fat that will come off when they freshen.

Judging Dairy Bulls.—In judging dairy bulls, the same essentials are looked for as in judging dairy cows; namely, constitution, capacity

for feed, dairy conformation, style and general appearance, and development of rudimentary mammary system. In addition to this, it is important that the bull also possess masculinity.

Masculinity is indicated by a broader head with thicker and straighter horns than those of the cow. The neck is wider with a well developed crest on top and the shoulders are more prominent than those of the cow. Care must be taken to differentiate between coarseness and masculinity in development of these parts.

Giving Reasons.—In a judging contest, the giving of either oral or written reasons is very important. It is customary to give equal weight to both reasons and placing. A class, therefore, may be placed correctly and if no reasons are given, the contestant would get a rating of 50 out of a possible 100 points.

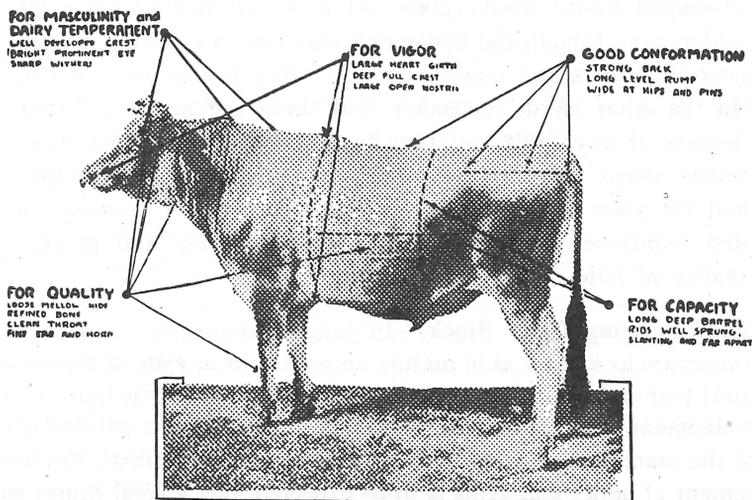


Fig. 7.—Typical high-type bull with important points designated.

Giving Oral Reasons

1. Be able to visualize a class well before attempting to give reasons. A set of accurate notes for study in organizing reasons is indispensable.
2. Have reasons well organized in your mind before attempting to give them orally.
3. In a general statement give the main points which have decided your placing, preferably giving them in the order of their importance. Then in a few brief, concise sentences, elaborate on the points in the same order as named. Make all reasons comparative. Use specific descriptive terms, avoiding general terms as much as possible.

4. Ordinarily begin reasons by telling why first animal was placed over the second one, and so on down the line. In case of some outstanding blemish or defect which would disqualify an animal or unquestionably place her at the bottom of the class, it is well to make a statement to this effect in beginning your reasons.
5. Remember that the judge who takes reasons has listened to reasons on this same class from perhaps fifty others, so that to attract and hold his attention your reasons must be:
 - a. Truthful (be sure of the points you make. Your reasons had better be one minute long and exact than two or three minutes long, but doubtful).
 - b. Forceful (get some expression and emphasis into your speech).
 - c. Concise and specific.Avoid (1) repetition; (2) vague or general statements; (3) minute descriptions which have little bearing on your placing; (4) points on which you are doubtful; and (5) a monotonous monotone in your delivery.
6. It is also true that the impression which the judge forms when you make your first appearance carries weight. Above all other things, try to be natural in your walk, your poise before the judge, and your tone of voice. When you approach the judge and stand before him, be at ease, yet stand erect with hands in an easy natural position. When he indicates that he is ready for your reasons, give them in as convincing a manner as possible. Talk to the judge, not to the floor, the window, or the ceiling. In case of questions from the judge, try to visualize the class and see the points which he asks about. If you cannot remember, however, it is not a crime to give an "I don't know." Better do that than to guess.

Descriptive Terms Used in Referring to Dairy Cattle

1. *Pertaining to General Conformation and Appearance.*—Superior dairy or breed type, more size and scale, superior balance, neater, more style.

2. *Pertaining to Milk Secreting System.*—Udder or mammary system well developed, symmetrical, attached high behind, extends well forward, level floor, shows good balance, is of fine texture, full, pliable, soft, mellow, elastic; shows lack of development, deficient in fore or rear quarters, quartered, divided, tilted, funnel shaped, pendulous, meaty, hard, non-elastic; teats of convenient size and well placed, udder veins plainly visible, milk veins large, long, tortuous, crooked, branching, entering large wells.

3. *Pertaining to Body.*—Long, deep, close-coupled, shallow barrel, capacious, roomy, lacking in barrel capacity, cut up in middle, good spring of rib, slab sided, ribs wide apart, set too close together, straight, strong back, low weak back.

4. *Pertaining to Hind Quarters.*—Rump, long, level, carries out well to tail head, hocks and pin bones prominent, high and wide apart, level between hocks and pin bones. Neat, level tail head, rough, high, prominent, pinched tail head. Hind quarters trim, not meaty or beefy. Thigh thin.

5. *Pertaining to Fore Quarters.*—Light, trim, well laid in over shoulders, sharp withers, shoulders smooth and sloping. Heavy over shoulders, coarse and blunt over withers, falls off in crops, rough over shoulders. Chest deep, full and wide at floor, showing good constitution, large heart girth, shallow or narrow chested.

6. *Pertaining to Head and Neck.*—Neck refined, long, neatly joined to head and shoulders, brisket lean and light, throat clean. Neck coarse, heavy, ewe-necked. Head clean cut, forehead broad and dished, ears fine, eyes large and bright. Broad, strong muzzle, large open nostril, strong clean cut jaw, shows femininity or sex character, characteristic of breed type. Dull eye, listless appearance, coarse, bullish head.

7. *Pertaining to Temperament.*—Superior dairy temperament, more angularity throughout, prominent hocks and pin bones, sharp withers, wedge-shape, nervous, irritable, or placid, gentle disposition.

8. *Pertaining to Quality.*—Fine silky hair, loose, mellow hide, superior handling qualities, fine boned, coarse hair, tight, harsh hided, board hide, poor handler, raw boned.

9. *General Terminology.*—Avoid too much repetition. Avoid the use of "better" as in saying "better barrel," "better head." Instead, tell why it is better, as "larger, more capacious barrel," "more feminine head."

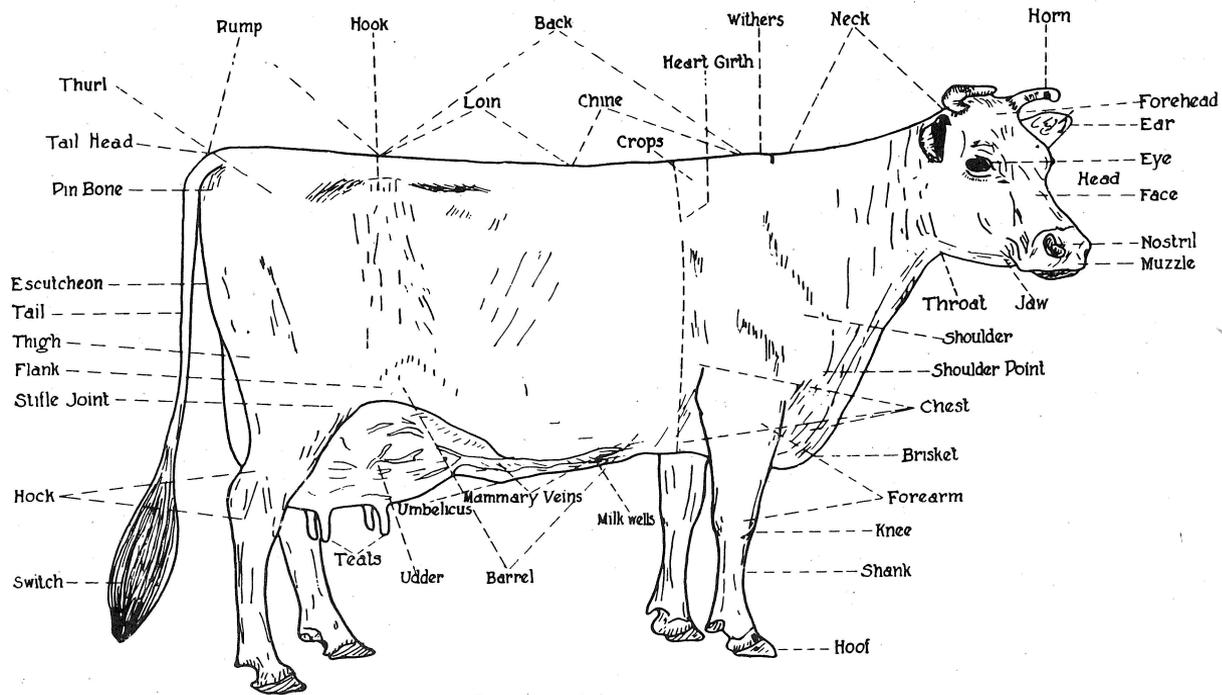


Fig. 8.—Parts of a dairy cow.

IX. FITTING ANIMALS FOR THE CLUB SHOW.

While the average club member does not want to become a professional showman, yet there are a few simple rules which the member

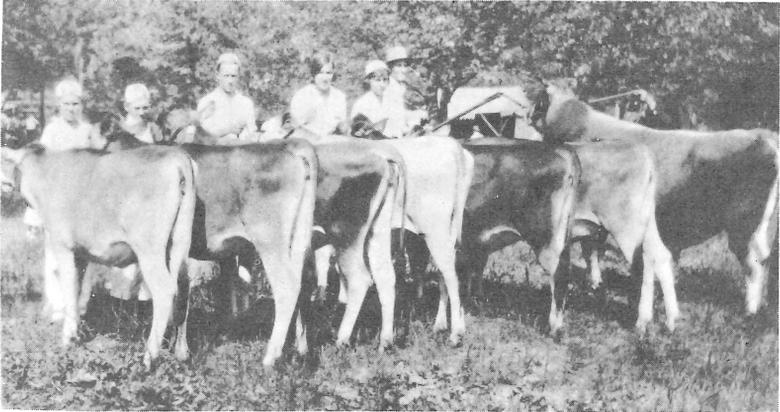


Fig. 9.—The 4-H dairy club round-up.

should observe in getting the calves ready for the club show. Some of these are:

1. The animals to be shown should be started at least two months before the first show. It is very difficult, if not impossible, to take animals out of a pasture a few days before show time and have them look their best. Time is required to teach the animals to lead readily. Dairy animals cannot be gotten into the proper physical condition for showing unless they have had the proper feed, care, and attention for a considerable period before they are to be shown.

2. After the animals have been selected, they should not be out of doors during the heat of the day in the hot sun. Keep them in comfortable stalls and, if possible, darken the barn and keep out the flies.

It is desirable that the showman and his animals understand each other. Begin early to teach the animals to lead readily and stand squarely on their feet so that they will show to the best advantage. Frequent handling is necessary in order to properly train the animals.

3. Calves should always show a large body capacity without being "potbellied." In order to accomplish this, they should be fed all the roughage they will consume all the time after six months of age.

4. Animals should be sleek and show a good quality of skin and hair. There are two good methods of accomplishing this. About a month before the show season opens, blanket the animals heavily until the skin becomes mellow. Lighter blankets may then be used. The blankets should be removed each day and the animals thoroughly

groomed. Use soft brushes, soft cloths, a little sweet oil, and plenty of hand rubbing.

The other method is to add a little extra laxative feed like oil meal or wheat bran to the grain ration for a month or so before the show.

5. The animals should have a neat and clean-cut appearance, especially about the head and ears. Sometimes clipping the long hair will help the appearance of a heifer remarkably.

6. All animals should be broken to lead before the show and should be led in with a neat halter, the member walking on the left side of the animal. It is possible to make a very nice looking halter out of an ordinary small rope.

7. If the horns have been allowed to grow and the horns and hoofs are rough, sometimes it is well to smooth them off with a little sandpaper.

8. Clean the animal thoroughly before leading her into the show ring. No judge can place an animal up if it is covered with dirt and filth. Besides that, any good club member would be ashamed of his animal in that condition. A little time with a bucket of water and a brush will be well spent. The following outline should be used:

- (1). Wash the animal with tar soap.
- (2). Train horns. Shorten long, coarse horns with a rasp. Scrape horns with glass or mower section, smooth with paste, pumice stone and sweet oil. Smooth with emery paper. Polish with sweet oil or metal polish. Feet should be trimmed squarely to allow animal to stand.
- (3). Groom daily, using soft brush.
- (4). Sponge daily, using a bucket of water to which has been added one teaspoonful of tincture of green soap. Then hand rub the animal.
- (5). Keep the animal blanketed. The blanket may be made from burlap sacks.
- (6). Keep animal in dark stall away from flies during the day. It may be allowed on pasture at night.
- (7). A satisfactory grain mixture is 5 parts of bran, 5 parts of oats, 2 parts of corn, and 2 parts of oil meal. Add one peck of salt to each ton of mixture. Feed from 10 to 15 pounds daily to the cows. The young stock may be fed according to their size. Mixed hay is usually preferred for the show animals as it is not as laxative as alfalfa hay. Beet pulp may be used for succulent feed. When the animals are in transit reduce the feed allowances. Give them plenty of water from your own containers.

- (8). Ten days or a week before the show, clip the head and neck, belly, udder and tail.
- (9). The heifer should be trained to stand, pose, and to be led each day so that at show time she may be shown to an advantage. An untrained heifer never wins many
- (10). The day before the show is a busy one. There are many things to be looked after. The animals look best when they are nicely filled out. This appearance may be accomplished by cutting down on their feed before the show. On show day, feed them the day's ration before they go into the ring. Just before they are shown, let them drink only enough water so that they look nicely filled out.

Braid the switch and tail the night before and comb it out just before entering the ring. Cows should be milked clean late the night before the show and not again until after the show.

- (11). After the cattle are unloaded at the show, first see that they are well bedded in a comfortable stall. Keep the stalls clean and neat at all times. Visitors will appreciate this. It is desirable to have some information in printed form about your cattle so that it may be passed out to the visitors who are interested. Have someone near at all times to show the animals to the visitors and to answer questions that may be asked. Do all you can to win, but if the decision of the judge goes against you do not complain. Try to find out the faults of your cattle and return next year with a better herd.

X. REFERENCES

- Raising the Dairy Calf—Missouri Experiment Station Bulletin 377
 Testing Milk and Cream—Missouri Experiment Station Circular 189
 Rations for Dairy Cows—Agricultural Extension Service Circular 405
 Dairy Cattle Judging—U. S. D. A. Farmer's Bulletin 1769
 Dairy Cattle Breeds—U. S. D. A. Farmer's Bulletin 1443

XI. THE 4-H DAIRY CLUB OBJECTIVES

Dairy Club Project.—(Five sub-projects)

1. *Dairy I—Calf.*—The objectives of each club member are to feed and care for a dairy calf up to the breeding age; and to keep project records. The project work can be started at any time, but preferably so that the animals can be bred between November 1 and February 1, when Dairy II is started.

2. *Dairy II—Heifer.*—The objectives of each club member are to feed and care for a dairy heifer from the time of breeding through the first calving period; and to keep project records. Old project groups should be reorganized at the close of Dairy I; new projects, in January.

3. *Dairy III—Cow.*—The objectives of each club member are to feed and care for a producing cow for a period of one year, preferably beginning about the freshening time; and to keep project records. Old project groups should be reorganized at the close of Dairy II; new projects with freshening cows, in the fall.

4. *Cow Testing.*—The objectives of each club member are to keep a record on one or more producing dairy cows of the home farm (preferably on all cows, if there are five or fewer) for a period of two months (60 days), to make daily weights of the milk from each cow by milkings, to make butterfat tests of the milk of each cow each month and preferably once each week, to measure and weigh one day's feed each month and to use these weights as an average for the number of days in the month; and to keep project records. These project groups should be started before November 1.

XII. RECORD AND REPORT BLANK FOR THE 4-H DAIRY CLUB MEMBER

Name..... Address County.....
 Leader's Name..... Name of Club.....
 Date Started..... Date Completed.....

Summary of General Club Activities.

1. Where did you exhibit?
2. No. of individual demonstrations given before the club?
3. How many team demonstrations did you help give?
 Where?
4. Where did you judge?
5. Value of club awards won\$.....
6. What special club activities, if any, did you attend, such as a 4-H club camp, State 4-H Club Round-up at the College of Agriculture, etc.?
7. How many club meetings did you attend?

Breeding Record Sheet.

Name of Sire—

Name of Animal	Previous Year		Months-Breeding, Dry and Freshening Dates.
	Fresh	Bred	

Explanation.—Fill out all the blanks and the summary of club activities; write the story of club work for the year; hand this record book to the local club leader; attend the round-up or achievement program; and then your club work will be completed.

If more space is needed for story, attach extra sheets.

